Highly Pathogenic Avian Influenza Outbreak and Response

APHL Annual Meeting
Joni Scheftel DVM MPH
State Public Health Veterinarian Supervisor, Zoonotic Diseases Unit
Minnesota Department of Health
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Overview

- Influenza viruses are shared by humans and animals
- Highly Pathogenic Avian Influenza
- MDH response
Influenza A Viruses

- Infect multiple species
- Seasonal human influenza typically H1 & H3
Avian Influenza Viruses in Poultry

- Low pathogenic vs. High pathogenic
  - Determined by virulence in domestic poultry in the lab setting
  - Molecular markers on the HA gene
- Circulation of low path AI viruses (that come from wild birds) in poultry flocks can result in mutation to high path
- Or can have direct introduction of a HPAI virus from wild birds to poultry
HPAI Viruses

• Severe illness, high fatality in poultry
  – Up to 90-100% mortality

• H5 and H7 are the only known HPAI subtypes

• HPAI is a foreign animal disease
  – Not normally found in the US
  – Unlike its very common low-path cousins
Introduction of Avian Influenza Viruses into Domestic Poultry Flocks

Direct Contact
- Exposure to infected poultry or wild birds

Indirect Contact
- Contaminated water
- Contaminated equipment
- Contaminated shoes or clothing
- Airborne movement of virus
- Animal vectors
HPAI Response Steps

- **Quarantine**
  - Restrict movement of poultry and equipment

- **Eradication**
  - Depopulation

- **Monitoring**
  - Testing wild and domestic birds in area surrounding infected flock

- **Cleaning and Disinfection**
  - Removing virus

- **Testing**
  - Establish freedom from disease on farms
History of U.S. HPAI Outbreaks

• 1924 East Coast live bird markets, H7
• 1983 Northeastern U.S., H5N2
  – 448 flocks - 17 million birds
  – $65 million losses
• 2004 Texas chickens, H5N2, 1 flock
• Dec 2014- June 2015 Northwest and Midwest, H5N8, H5N2
• Jan 2016 Indiana H7N8
  – 1 High Path and 9 Low Path H7N8 flocks

- 21 states
- > 50 million birds
- Depopulation: 7.5% US turkey inventory, 10% layer inventory
- USDA spent >$850 million in containing outbreak
- Net losses could exceed $1 billion

USDAAPHIS
This was the largest and most expensive animal health emergency in US history

An additional 100 million was spent on planning and preparing for a possible re-emergence in the fall of 2015 and spring of 2016

USDA APHIS Final Report for the 2014-2015 outbreak of HPAI in the US
H5N2 in the Mississippi Flyway

- March 4 – June 16
- Initially commercial turkey operations
  - Later table egg layers, a few backyard flocks and wild birds
  - No broiler chickens affected
- Minnesota, Missouri, Arkansas, Kansas, Montana, South Dakota, North Dakota Wisconsin, Iowa, Nebraska
- Indiana – 5/11/2015 H5N8, backyard flock
Minnesota

- First detection 3/4/15
- 108 premises affected (4 dangerous contacts)
  - 79 commercial turkey growers
  - 20 breeder turkey facilities
  - 4 table egg layer facilities
  - 1 backyard chicken and duck flock
- > 9 million birds died from the virus or were depopulated
HPAI H5N2-Infected Poultry Flocks in Minnesota by Week of Onset of Increased Mortality, 2015 (n=104)

- 23 counties
- Over 9 million birds affected
- 376 poultry workers monitored in 104 flocks
HPAI H5N2-Infected Poultry Flocks in Minnesota by County, 2015 (n=108)
Human Infections with HPAIViruses (in general)

- Rare
- Spread to people through direct contact with infected birds or their environments
- Typically found only in people with close contact with infected birds
  - Rare human-to-human transmission
- Asian HPAI H5 virus, HPAI H7N9 & LPAI H7N9 in China
Symptoms in People

• Can range from mild to severe
• Conjunctivitis
• Influenza-like illness (ILI)
  – Fever
  – Cough
  – Sore throat
  – Pneumonia
No human infections with this H5N2 HPAI strain of the virus have been identified in the United States or Canada
If no-one has gotten sick, why is public health so concerned about this H5N2?
Guangdong China, 1996
• Death of domestic geese by progenitor virus

Hong Kong, 1997
• Emergence in farm and market poultry
• Culling, movement restrictions

Late 2003-2004
• Emergence in wider Asia by movement of domestic poultry

2005
• Movement of virus to Europe and Africa by migratory birds

Present Day
• 16 countries
• Hundreds of millions of poultry slaughtered
• 826 human cases, 440 deaths (53% case fatality)


Slide courtesy of Amanda Beaudoin
Evolution of the influenza A(H5) haemagglutinin: WHO/OIE/FAO H5 Working Group reports a new clade designated 2.3.4.4

12 January 2015

Recent detections of highly pathogenic avian influenza A(H5N8) in East Asia and Europe, A(H5N8) and A(H5N2) in North America, and A(H5N6) in East and Southeast Asia, have prompted the WHO/OIE/FAO H5 Evolution Working Group to review and update the H5 haemagglutinin (HA) clade nomenclature (1-4), which was last revised based on sequence data available prior to December 2012 (4). Although a detailed report describing the update of the existing nomenclature is in preparation, considering the high likelihood that these viruses will continue to be detected and reported, timely communication of the new clade designation is warranted. The phylogenetic analysis of H5 HA sequences from these viruses revealed extensive divergence and indicated the need to update the clade nomenclature for H5N1, H5N2, H5N5, H5N6, and H5N8 subtype viruses clustering in this HA group. After careful analysis of all available H5 sequence data, this group of HA gene segments has been designated as clade 2.3.4.4 and use of this unified classification is recommended. The virology, animal and public health communities are encouraged to adopt this clade designation for these H5 HAs and discontinue use of the provisional clade 2.3.4.6 designation, which was assigned tentatively during the WHO Vaccine Virus Consultation in September 2014 in reviewing and selecting candidate vaccine viruses of this emerging group of viruses (5).
Emergence of H5N2 in U.S.


Why?

• Because the outbreak H5 is a descendant of the Asian H5 that is known to infect people
• And influenza viruses mutate and adapt to different hosts relatively easily
• It only makes sense to monitor people who have had contact with infected flocks
• And to test those people who develop symptoms for avian influenza
Role of MDH

- Protect human health
- Support other responding agencies
- Monitor the health of people in direct contact with infected birds
- Provide guidance on infection control and use of PPE for poultry personnel
- Serve as a source of information for the industry and the public
MDH Actions

- Recommend human influenza vaccination
- Interview workers for work duties, flock contact and illness history
- Assess exposure based on contact and PPE usage
  - Consider antivirals based on interview
- Initiate active surveillance for respiratory symptoms in humans exposed to infected poultry – “Monitoring”
- Test workers with respiratory symptoms
Poultry Worker Monitoring

• Conduct interviews with employees on infected premises to determine exposure
  – Exposed = Worker with contact with birds or entered barn on infected premises

• Contact any exposed persons for 10 days by text message, email, or phone call
  – Infected barns – Every day
  – Healthy barns – Day 0, 5 and 10

• 55% of poultry personnel chose to be texted
PPE Recommendations

• Based on CDC & OSHA guidelines
• Washable or disposable coveralls
  – Tyvek suits
• Disposable gloves
• Rubber boots that can be disinfected
  – Boot covers
• Goggles or safety glasses
• N-95 respirator or dust mask
• Washable/disposable hat or hood
Other Recommendations

• Avoid touching your eyes, nose, or mouth while working

• When work is complete, remove your PPE and wash hands with soap and water
  – Use alcohol-based hand gel until hands can be washed
Tamiflu

- 75 mg Oseltamivir twice daily for 7 days
  - Prophylactic
- Recommended if contact with sick birds without the use of full PPE
  - Sampling sick birds
  - Picking up dead birds
  - Necropsy
  - Preparing for depopulation
Characteristics of Poultry Workers

- Attempted to contact: 437
  - Unable to contact: 60 (14%)
  - Monitored 377 workers (86%)
- 89% male
- Median age 41 years
  - Range, 5-77 years
Characteristics of Poultry Workers

- Type of operation
  - 58% Breeder turkey
  - 22% Commercial turkeys
  - 19% Egg layers
  - 0.6% Backyard flock
Primary Language: n=437

- 363 English speakers
- 62 Karen Speakers
  - Karen people from Myanmar and Thailand, large refugee settlement in MN
- 12 Spanish speakers
Non-English Speakers

- Interpreter needed for 21 (6%) poultry workers, 11 Karen and 10 Spanish
- Contacted either by interpreter through a language line or by native speakers working at MDH
- Health information for poultry personnel, including PPE recommendations, translated into Spanish and Karen
Lost to Follow-up and Language

- 60 poultry personnel lost to follow-up
  - 13 English speakers
  - 29 Karen speakers
  - 4 Spanish speakers
  - 14 Unknown language
Compliance with Recommended PPE

- 194 (51%) did not adhere to wearing all recommended PPE components
- Poorest compliance with wearing eye protection
- As outbreak progressed, compliance improved

<table>
<thead>
<tr>
<th>PPE Component</th>
<th>Total (%) N=379</th>
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<tbody>
<tr>
<td>Coveralls</td>
<td>263 (69.9)</td>
</tr>
<tr>
<td>Gloves</td>
<td>291 (77.4)</td>
</tr>
<tr>
<td>Boots</td>
<td>297 (79.0)</td>
</tr>
<tr>
<td>Eye protection</td>
<td>186 (49.1)</td>
</tr>
<tr>
<td>Mask</td>
<td>254 (67.6)</td>
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</tbody>
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Tamiflu and Symptomatic People

- Monitored 377 workers
  - Recommended oseltamivir: 195 (52%)  
  - Agreed to take oseltamivir: 118 (61%)
- Symptomatic workers in contact with infected flocks tested: 15 (4%)
  - A few other responders also tested (next talk!)
Other MDH Responsibilities

• Asked by national incident command staff to investigate 2 clusters of disease
• In April, cluster of 5 cases of GI illness
  – 2 hospitalized, 1 ER visit
  – 1 lab confirmed *Campylobacter* infection; 1 probable infection; 3 suspect
• *Campylobacter* found in poultry feces and environment- good PPE reminder
• Clean trailer for resting and eating was provided
Human Seasonal Influenza B Outbreak in Minnesota ICPs

• 19 cases in Willmar
  – Illness onsets from 5/23-6/4
• 11 cases in Worthington
  – Illness onsets from 5/23-6/1
• Recommended that symptomatic people be evaluated right away, take Tamiflu and be isolated until fever resolves for 24 hours
• Recommended that incoming people be vaccinated for influenza
Successes and Challenges

• Great cooperation from the poultry industry
  – Only 3 people lost interest during monitoring
  – Occupational health willing to facilitate prophylaxis
• ED’s, urgent care and clinics willing to assess ill poultry workers and responders
Successes and Challenges

• Transient responder population
  – Rotation every 3 weeks
  – Unclear when to report illness
  – Unclear who had responsibility to monitor after responder returned home

• USDA Contractors
  – Rapid and large deployment
  – No designated point of contact to address health issues
Outreach

PROTECT YOUR BIRDS
PROTECT YOURSELF
GET YOUR FLU SHOT

MDH
Minnesota Department of Health
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QUESTIONS?